

Dorsal Dislocation of the Trapezoid at the Scaphotrapeziotrapezoidal Joint

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Abstract

Background Axial dislocations of the trapezoid are rare, high-energy injuries. We present an unusual case of isolated dorsal dislocation of the trapezoid and index metacarpal at the scaphotrapeziotrapezoidal (STT) joint due to steering wheel injury.

Case Description A 56-year-old man presented to our office with right hand pain for 10 days after a head-on motor vehicle accident (MVA) in which he suffered an axial load injury to his hand on the steering wheel. X-ray images were reported as unremarkable. Further workup with computed tomography (CT) scan revealed an isolated dorsal dislocation of the trapezoid with its associated index metacarpal at the STT joint. The patient was treated with open reduction, pinning, and dorsal capsulodesis.

Literature Review Dorsal dislocation of the trapezoid has been associated with high-energy trauma such as industrial accidents or motorcycle accidents; however, recent case reports have also revealed an axial loading mechanism from a steering wheel injury as an increasingly common mechanism. These cases typically occur concomitantly with other fractures or dislocations of the carpal bones or carpometacarpal (CMC) joints. Multiple reports of delayed diagnoses due to distracting injuries and difficulty of recognition on plain radiographs have been reported.

Clinical Relevance Dorsal dislocation of the trapezoid with its associated second metacarpal is a rare, high-energy injury that can often be missed on plain radiography. We report a rare variant with no concomitant injury to the metacarpals or carpal bones. A low index of suspicion for further imaging should exist in the setting of an axial loading injury to the hand.

Keywords

- scaphotrapezio-trapezoid dislocation
- trapezoid dislocation
- axial carpal dislocation

Dislocation of the trapezoid at the scaphotrapeziotrapezoidal (STT) joint is a rare injury typically resulting from high-energy trauma.^{1–10} Previously reported mechanisms of injury include industrial trauma, motorcycle accidents, and falls from height.^{1–8} Recently, an axial loading mechanism from the steering wheel during a head-on collision has been described to result in these injuries.¹¹ Dorsal dislocation is most common, although volar dislocations have been described.^{12,13} Reports of trapezoidal dislocations have been isolated to case reports or small (<5 patient) case series, and isolated injuries represent the most uncommon variant of these cases.

Delayed diagnoses have been reported in trapezoidal dislocations as a result of the occurrence of distracting injuries, failure to image the injured extremity, and difficulty recognizing the dislocation on plain radiographs.^{6,7} Concomitant injuries to the hand, including multiple carpometacarpal (CMC) joint fractures/dislocations and associated carpal bone fractures, are commonly associated with trapezoidal dislocations, and isolated injury has been extremely rare in the literature.^{1,3,6–11} These injuries are easier to recognize on plain radiographs and may distract attention away from the more subtle findings of trapezoidal injury at the STT joint.

The purpose of this report is to describe a case of dorsal dislocation of the trapezoid at the STT joint due to a steering wheel injury that was not appropriately recognized at time of presentation. Given that these are very rare injuries, a high index of suspicion for further imaging is necessary to avoid delayed diagnosis and unnecessary patient morbidity.

Case Report

Our patient is a 56-year-old man who presented to the clinic with right hand pain and swelling for 10 days after a head-on motor vehicle accident (MVA). His right hand had been on the steering wheel at the time of the collision, and the patient associates this event with his injury. He presented to the emergency room, where X-ray images were reported as unremarkable. A computed tomography (CT) scan was ordered, on which the radiologist noted a possible dorsal subluxation of the trapezoid at the STT joint. The patient was placed in a volar splint and referred to a local hand specialist for further management. After clinical examination and review of his imaging, the subtle radiographic findings were not appreciated, and the patient was given a splint and informed that his injury could be managed conservatively. Over the next week, the patient continued to experience pain and swelling, and he presented to our clinic for a second opinion.

Physical examination revealed significant swelling on the dorsal aspect of his hand. He had significant tenderness to palpation in the region of the first, second, and third CMC joints. Finger range of motion (ROM) was limited by swelling, but both flexor and extensor tendons to all digits were intact. He had painless gentle ROM at his radiocarpal joint. His neurovascular exam was within normal limits.

Three X-ray views of the hand obtained in the office showed subtle proximal migration of the trapezoid and second metacarpal on the anteroposterior (AP) view relative to the third CMC joint. The lateral views did not clearly identify any bony injury (►Fig. 1). CT scan with 3D reconstructions showed dorsal and proximal migration of the

trapezoid at the STT articulation, with the second metacarpal maintained in its relationship with the trapezoid (►Figs. 2 and 3). A small dorsal nondisplaced fracture of the capitate and a small avulsion fracture with subluxation of the trapezium at the STT joint were also present (►Figs. 2 and 3). The patient was indicated for open reduction through a dorsal approach. At the time of surgery, the trapezoid with its associated second metacarpal was proximally migrated along the scaphoid, and the attachments between the trapezoid, scaphoid, and capitate were torn. The trapezium maintained its attachments with the trapezoid and had some rotational deformity with subluxation at the STT joint. To reduce the trapezoid back into its anatomic location, the attachments to the capitate, scaphoid, and trapezium all required complete division. A nondisplaced fracture of the trapezoid was noted on inspection. Once the reduction of the second metacarpal was obtained, it was held with two Kirschner wires (K-wires), from the first to the second, and then the second to the third metacarpal. A suture anchor into the trapezium was then used for dorsal ligament repair and capsulodesis.

Discussion

In this report, we describe an unusual case of dorsal trapezoidal dislocation, maintaining its association with the second metacarpal, in addition to trapezium subluxation at the STT joint after a steering wheel injury. The significance of the injury was unrecognized despite axial imaging because the radiographic findings were subtle and there were no obvious associated injuries to the carpus or metacarpals. Trapezoidal dislocations are extremely rare injuries that have been reported as isolated cases or small case series.^{1–11,14} Axial loading of the second metacarpal with the wrist flexed has been postulated to result in dorsal trapezoidal dislocation because of weaker ligamentous attachments dorsally and the wedge shape of the trapezoid at the STT articulation, where the trapezoid becomes exposed and loses its bony support from the scaphoid with the wrist in flexion.^{4,11,15} Traditional mechanisms of injury included industrial accidents,



Fig. 1 (a) AP, (b) oblique, (c) lateral radiographs of wrist at presentation show subtle proximal migration of the trapezoid and second metacarpal at the STT joint seen on AP projection (a).

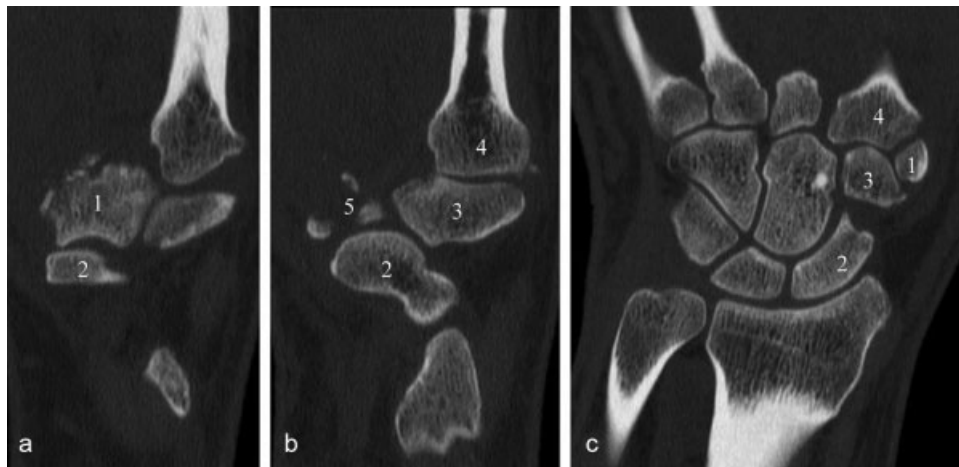


Fig. 2 (a) CT scan with sagittal reconstructions of the wrist show subluxation of the trapezium (1) at its articulation with the scaphoid (2). (b) CT scan with sagittal reconstructions of the wrist show dorsal dislocation of the trapezoid (3) at its articulation with the scaphoid (2), maintaining its relationship with the second metacarpal (4). Volar avulsion fractures of the trapezium are visualized (5). (c) CT scan with coronal reconstructions of the wrist show subtle dorsal relationship of trapezoid (3) relative to scaphoid (2).

motorcycle trauma, and falls from height.¹⁻⁸ More recently, similar to our case, Keith and Wollstein described two cases of trapezoidal dislocation due to steering wheel injury after head-on collision.¹¹ In contrast to our case, they described multiple CMC dislocations, including the index metacarpal at its trapezoidal articulation.¹¹ Isolated STT joint injury appears to be a rare variant.

Trapezoidal dislocations are often reported in conjunction with other injuries in the hand and wrist. The most commonly described associated injuries include trapezium dislocation as part of an axial radial disruption of the carpus^{1,2,4} and multiple CMC dislocations.^{1,3,6-11} Complete dislocation of the trapezoid from the scaphoid and second metacarpal articulations with proximal migration of the second metacarpal into the remaining defect has also been described.^{1,4,16,17} Palmar dislocations of the trapezoid appear to be less common than dorsal dislocations because the palmar ligamentous attachments of the trapezoid are stronger than the dorsal ligaments.^{12,13} Similar to our case, injury isolated to the STT with maintained relationship of the trapezoid and

second metacarpal appears to be a less common variant that has been described infrequently in previous studies.¹⁸ Due to the high-energy nature of these injuries, associated soft tissue injury frequently occurs.^{2,9} The high prevalence of concomitant injury increases the risk of missing the subtle radiographic findings of this injury. A straight PA view may aid in identifying the normal clear space that exists between the trapezoid and trapezium articulation with the scaphoid.¹⁹ CT scan can also help identify injury at the STT joint when radiographs are inconclusive, and thin cuts and 3D reconstructions may be necessary to obtain the proper planes needed to identify subtle changes.^{1,20}

A high index of suspicion must be maintained after high-energy injuries to the hand and wrist because distracting injuries and subtle radiographic findings may delay diagnosis. Ostrowski et al described a case of a severe crush injury with an open laceration to the hand where dorsal dislocation of the trapezoid along with subluxation of the base of the second and third metacarpals was unrecognized on initial injury radiographs.⁷ Maxwell et al reported scaphotrapezial and

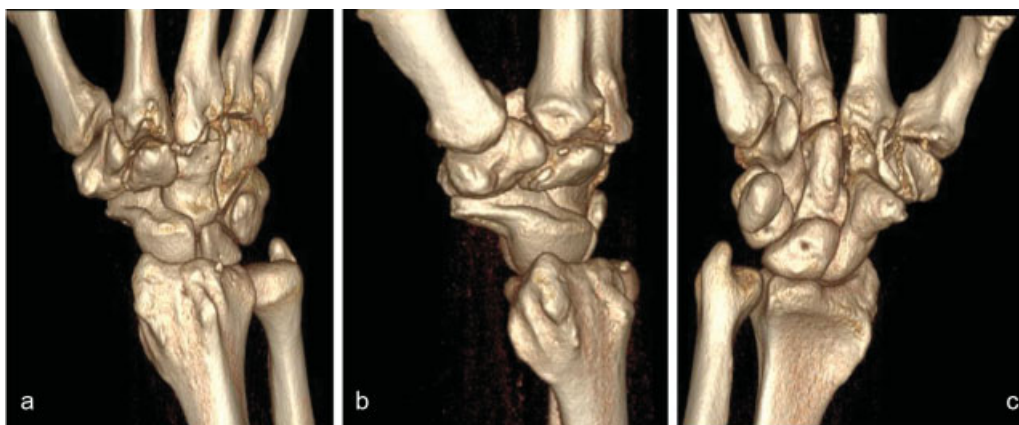


Fig. 3 CT scan with 3D reconstructions showing (a) dorsal, (b) lateral, and (c) volar projections of the wrist. Dorsal displacement of the trapezoid with its associated second metacarpal is appreciated particularly in (b). Small volar avulsion fracture on the trapezium is again visualized with subluxation at the STT joint.

trapezoidal dislocations in a motorcyclist in association with third, fourth, and fifth CMC dislocations.⁶ The subtle radiographic findings at the STT joint were not recognized until the postoperative period after the other fractures and dislocations at the CMC joints had been addressed. Broadbent et al reported an in situ rotatory dislocation of the trapezoid associated with CMC joint dislocations that was recognized only after advanced imaging.²¹ A low threshold for advanced imaging is critical after high-energy mechanisms of injury such as crush injury or MVA and pain or swelling out of proportion to plain radiographic findings. Axial loading of the hand on the steering wheel during MVA appears to be a common mechanism associated with trapezoidal dislocation in recent years.

In conclusion, we report a rare case of dorsal dislocation of the trapezoid at the STT joint with its associated second metacarpal along with subluxation of the trapezium at the STT joint due to a steering wheel injury. This case report is intended to raise awareness of this injury and inform clinicians to maintain a low threshold for appropriate advanced imaging in patients with high-energy trauma to the hand and wrist to avoid delayed diagnosis.

Conflict of Interest

None

References

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